

In this review:

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Koenig, R. **African penguin populations reported in a puzzling decline.** *Science* 315(5816): 1205, 2007.

B. Recent articles with abstracts

Roycroft, D., Kelly, T.C., and Lewis, L.J. **Behavioural interactions of seabirds with suspended mussel longlines.** *Aquaculture International* 15(1): 25-36, 2007.

Notes: Increased abundances of a number of seabird species have been found in areas of mussel longline aquaculture (compared to control sites) in a recent study at Bantry Bay, southwest Ireland. The aim of this study was to investigate whether this form of mussel aquaculture also affects the activity budgets and foraging behaviour of these seabirds. Scan-sampling was used to compare seabird activity budgets between three areas of mussel longline aquaculture and three control sites. Foraging activities of Great-Northern Divers *Gavia immer*, an Annex 1 species under the European Union's Birds Directive, were also compared between sites using focal sampling. The behaviour of gulls (*Larus* sp.), Cormorants *Phalacrocorax carbo*, Shags *Phalacrocorax aristotelis* and Great-Northern Divers (but not auks, Alcidae) differed significantly between areas of mussel aquaculture and control sites in this study. Mussel suspension buoys were heavily utilized by gulls, cormorants and shags as safe perching platforms for preening activities. Gulls also fed extensively on epifauna attached to the buoys. Great-Northern Divers spent more time snorkelling (head submerged in search of food) in mussel sites than in the control sites, however dive duration and visible foraging success rates did not differ significantly between sites. Overall, the environmental impact of mussel suspension culture appears to be positive or neutral on marine bird species occurring at this study site.

Bull, L.S. **Reducing seabird bycatch in longline, trawl and gillnet fisheries.** *Fish and Fisheries* 8(1): 31-56, 2007.

Notes: With an increasing number of seabird species, particularly albatross and petrels, becoming threatened, a reduction of fishery impacts on these species is essential for their future survival. Here, mitigation methods to reduce and avoid seabird bycatch are assessed in terms of their ability to reduce bycatch rates and their economic viability for longline, trawl and gillnet fisheries worldwide. Factors influencing the appropriateness and effectiveness of a mitigation device include the fishery, vessel, location, seabird assemblage present and season of year. As yet, there is no single magic solution to reduce or eliminate seabird bycatch across all fisheries: a combination of measures is required, and even within a fishery there is likely to be refinement of techniques by individual vessels in order to maximize their effectiveness at reducing seabird bycatch. In longline demersal and pelagic fisheries, a minimum requirement of line weighting that achieves hook sink rates minimizing seabird bycatch rates should be tailored with a combination of strategic offal and discard management, bird-scaring lines (BSLs) and night-setting, particularly in Southern Hemisphere fisheries. Urgent investigation is needed into more effective measures at reducing seabird interactions with trawl nets and gill nets. In trawl fisheries, a combination of offal and discard management, the banning of net monitoring cables, paired BSLs, and a reduction in the time the net is on or near the surface are likely to be the most effective in reducing seabird interactions with the warp cables and net. Few seabird bycatch reduction methods have been developed

for gillnet fisheries, although increasing the visibility of the net has been shown to reduce seabird bycatch. Further studies are required to determine the efficacy of this technique and its influence on target species catch rates.

Lee, D.E., Nur, N., and Sydeman, W.J. **Climate and demography of the planktivorous Cassin's auklet *Ptychoramphus aleuticus* off northern California: implications for population change.** *Journal of Animal Ecology* 76(2): 337-347, 2007.

Notes: 1. We performed demographic analyses on Cassin's auklet *Ptychoramphus aleuticus*, a zooplanktivorous seabird inhabiting the variable California Current System, to understand how temporal environmental variability influences population dynamics. 2. We used capture-recapture data from 1986 to 2002 to rank models of interannual variation in survival, breeding propensity, breeding success, and recruitment. 3. All demographic parameters exhibited temporal variability. Interannual variation in survival was best modelled as a nonlinear function of the winter Southern Oscillation Index (SOI). Breeding propensity was best modelled as a threshold function of local sea surface temperature. Breeding success and recruitment were best modelled with year-dependent annual variation. 4. Changes in the SOI force El Nino/La Nina events, which in turn alter prey availability to seabirds in this system. Demographic responses varied during El Ninos/La Ninas. Survival diminished substantially during the 1997-98 El Nino event, while breeding propensity was affected during both the 1992 and 1998 El Ninos. Breeding success was reduced during the 1992, 1993, and 1998 El Ninos, but was unusually high in 2002. Recruitment was higher at the beginning and end of this time-series. 5. While demographic responses varied interannually, parameter values covaried in a positive fashion, a situation conducive to rapid population change. During the 11 years study period, the Farallon auklet breeding population declined at $6.05 \pm 0.80\%$ (SE) per year, a cumulative decline of 49.7%. This study demonstrates how climate variability has influenced key demographic processes for this diminished marine bird population.

Milot, E., Weimerskirch, H., Duchesne, P., and Bernatchez, L. **Surviving with low genetic diversity: the case of albatrosses.** *Proceedings of the Royal Society B* 274(1611): 779-787, 2007.

Notes: Low genetic diversity is predicted to negatively impact species viability and has been a central concern for conservation. In contrast, the possibility that some species may thrive in spite of a relatively poor diversity has received little attention. The wandering and Amsterdam albatrosses (*Diomedea exulans* and *Diomedea amsterdamensis*) are long-lived seabirds standing at an extreme along the gradient of life strategies, having traits that may favour inbreeding and low genetic diversity. Divergence time of the two species is estimated at 0.84Myr ago from cytochrome *b* data. We tested the hypothesis that both albatrosses inherited poor genetic diversity from their common ancestor. Within the wandering albatross, per cent polymorphic loci and expected heterozygosity at amplified fragment length polymorphisms were approximately one-third of the minimal values reported in other vertebrates. Genetic diversity in the Amsterdam albatross, which is recovering from a severe bottleneck, was about twice as low as in the wandering albatross. Simulations supported the hypothesis that genetic diversity in albatrosses was already depleted prior to their divergence. Given the generally high breeding success of these species, it is likely that they are not suffering much from their impoverished diversity. Whether albatrosses are unique in this regard is unknown, but they appear to challenge the classical view about the negative consequences of genetic depletion on species survival.

Knudsen, L.B., Borga, K., Jorgensen, E.H., Van Bavel, B., Schlabach, M., Verreault, J., and Gabrielsen, G.W. **Halogenated organic contaminants and mercury in northern fulmars (*Fulmarus glacialis*): levels, relationships to dietary descriptors and blood to liver comparison.** *Environmental Pollution* 146(1): 25-33, 2007.

Notes: The northern fulmar (*Fulmarus glacialis*) is an interesting candidate for the study of patterns and levels of halogenated organic contaminants (HOCs) since they accumulate high levels of certain HOCs. In the present study we characterized a suite of established and novel HOCs in northern fulmars breeding on Bjørnøya in the Norwegian Arctic. A comparison between blood and liver HOC levels was made, and the levels were related to the ratios of heavier to lighter stable isotopes of nitrogen $^{15}\text{N}/^{14}\text{N}$ ($\delta^{15}\text{N}$) and carbon $^{13}\text{C}/^{12}\text{C}$ ($\delta^{13}\text{C}$) in muscle. A significant difference in congener patterns between blood and liver was found. The $\delta^{13}\text{C}$ was not related to HOCs, neither in liver nor in blood. Weak correlations were found between $\delta^{15}\text{N}$ and liver HOC levels. The 2,3,7,8-tetrachlorodibenzo-p-dioxin toxic equivalents (TEQs) in northern fulmars were well above thresholds for reproductive effects in seabirds.

Kooyman, G.L., Ainley, D.G., Ballard, G., and Ponganis, P.J. **Effects of giant icebergs on two emperor penguin colonies in the Ross Sea, Antarctica.** *Antarctic Science* 19(1): 31-38, 2007.

Notes: The arrival in January 2001 in the south-west Ross Sea of two giant icebergs, C16 and B15A, subsequently had dramatic affects on two emperor penguin colonies. B15A collided with the north-west tongue of the Ross Ice Shelf at Cape Crozier, Ross Island, in the following months and destroyed the penguins' nesting habitat. The colony totally failed in 2001, and years after, with the icebergs still in place, exhibited reduced production that ranged from 0 to 40% of the 1201 chicks produced in 2000. At Beaufort Island, 70 km NW of Crozier, chick production declined to 6% of the 2000 count by 2004. Collisions with the Ross Ice Shelf at Cape Crozier caused incubating adults to be crushed, trapped in ravines, or to abandon the colony and, since 2001, to occupy poorer habitat. The icebergs separated Beaufort Island from the Ross Sea Polynya, formerly an easy route to feeding and wintering areas. This episode has provided a glimpse of events which have probably occurred infrequently since the West Antarctic Ice Sheet began to retreat 12 000 years ago. The results allow assessment of recovery rates for one colony decimated by both adult and chick mortality, and the other colony by adult abandonment and chick mortality.

Wolf, S., Keitt, B., Aguirre-Munoz, A., Tershy, B., Palacios, E., and Croll, D. **Transboundary seabird conservation in an important North American marine ecoregion.** *Environmental Conservation* 33(4): 294-305, 2006.

Notes: Many seabird species of conservation concern have large geographic ranges that span political borders, forcing conservation planners to facilitate their protection in multiple countries. Seabird conservation planning within the seabird-diverse California Current System (CCS) marine ecoregion presents an important opportunity for transboundary collaborations to better protect seabirds across the USA/Mexico border. While seabird populations in the USA are relatively well-studied and well-protected, the status of seabird populations in the Mexican region of the CCS is not well known and seabird colonies have been virtually unprotected. This study synthesizes and supplements information on breeding seabird diversity and distribution, identifies and ranks threats to seabirds and evaluates conservation capacity in the Mexican CCS to provide a framework for transboundary seabird conservation throughout the CCS ecoregion. Island-breeding seabirds in Mexico support 43-57% of CCS breeding individuals, 59% of CCS breeding taxa and a high level of endemism. Connectivity between populations in Mexico and the USA is high. At least 17 of the 22 extant Mexican CCS breeding seabirds are USA/Mexico transboundary breeders or foragers, 13 of which are federally listed in the USA or Mexico. Introduced predators and human disturbance have caused multiple seabird population extirpations in the Mexican CCS because breeding colonies lack legal protection or enforcement. However, conservation capacity in this region has increased rapidly in recent years through the establishment of new protected areas, growth of local conservation non-governmental organizations, and increase in local community support, all of which will allow for more effective use of conservation funds. Transboundary conservation coordination would better protect CCS seabirds by facilitating restoration of seabird colonies in the Mexican CCS and enabling an ecoregion-wide prioritization of seabird conservation targets to direct funding bodies to the most cost-effective investments.

Valiela, I. and Martinetto, P. **Changes in bird abundance in eastern North America: Urban sprawl and global footprint?** *BioScience* 57(4): 360-370, 2007.

Notes: The abundance of birds recorded in the North American Breeding Bird Survey decreased by up to 18 percent between 1966 and 2005. The abundance of US and Canadian resident species decreased by 30 percent, and that of migrants within the United States and Canada decreased by 19 percent. By contrast, Neotropical migrants increased by up to 20 percent. Land-cover changes in northern latitudes therefore seem more consequential for bird populations than those occurring in Neotropical habitats. Lower abundances were most marked for resident breeding birds that used open, edge, and wetland habitats, the environments most affected by human disturbances -- particularly urban sprawl -- in northern latitudes. The abundance of resident and migrant forest-dwelling birds increased (although trends varied from species to species), with the increases seeming to follow the 20th-century expansion of forest area in northern latitudes, rather than the loss of Neotropical forests. The geographic footprint of changes in bird abundance linked to habitat changes in North America may thus be extending southward, with negative effects on birds that use open habitats and positive effects on forest birds.

Garthe, S. and Flore, B.O. **Population trend over 100 years and conservation needs of breeding sandwich terns (*Sterna sandvicensis*) on the German North Sea coast.** *Journal of Ornithology* 148(2): 215-227, 2007.

Notes: The breeding population of the sandwich tern (*Sterna sandvicensis*) on the German North Sea coast has undergone substantial fluctuations throughout the last 100 years. Numbers of breeding birds were fluctuating quite strongly in the first 30 years of the twentieth century. From 1930 to the mid-1950s, a relatively steady decrease occurred. A minimum was reached in 1965 with 2,243 pairs. Around 1970, numbers increased quite markedly up to the mid-1990s and reached a centennial maximum with 10,138 pairs in 1996. Most recently, the numbers have dropped to only 5,681 pairs in 2005, the lowest number over the last 30 years. Some colonies have existed over long periods, others only for short periods, with often substantial and sudden changes. The distribution at sea was studied by transect counts from ships. During the reproductive period, high totals were found between the mainland coast and the islands, up to 30 km from the outer coast/island line. The seaward extent of the sandwich tern distribution coincided quite well with the 20-m depth line. Maximum foraging ranges for single colonies were estimated to be ca. 45 km for Trischen, ca. 35 km for Norderoog and ca. 30 km for both Scharhorn/Niehorn and Juist. Overall flight ranges for all colonies were estimated at 33.8 km for 95% of the birds. Germany has a high international responsibility for the protection of this species. Only a few colonies exist every year, making this species very vulnerable to anthropogenic disturbance, pollution events and fishing activities.

Spear, K.A., Schweitzer, S.H., Goodloe, R., and Harris, D.C. **Effects of management strategies on the reproductive success of Least Terns on dredge spoil in Georgia.** *Southeastern Naturalist* 6(1): 27-34, 2007.

Notes: *Sterna antillarum antillarum* (Eastern Least Tern) historically nested on Atlantic Coast beaches and barrier island shores, but has moved inland to artificial habitats, such as dredge-spoil sites, as available natural habitat has been lost to development and increased human recreational activities. Least Terns readily nest on artificial sites, but the effects of different habitat characteristics and depredation conditions on reproductive success are unclear. We examined the effects of management strategies, disking and electric fencing, on daily survival rate (DSR) and 21-day survival rate (DSR²¹) of clutches, and on apparent nesting success on a dredge-spoil site in Georgia from 1993 through 1998. All 3 estimates of reproductive success increased as management intensity increased. Significantly ($\chi^2_2 = 185.8$, $P < 0.001$), DSR increased from 0.88 (1993, no management) to 0.97 (1998, disking in March to remove vegetation and enclosure with an electric fence). Corresponding DSR²¹ were 0.06 and 0.59, respectively. Artificial nesting sites can be improved by management actions, and such work may be increasingly important as natural habitat for beach-nesting birds continues to decline in availability and quality.

Reyes-Arriagada, R., Campos-Ellwanger, P., Schlatter, R.P., and Baduini, C. **Sooty Shearwater (*Puffinus griseus*) on Guafo Island: the largest seabird colony in the world?** *Biodiversity and Conservation* 16(4): 913-930, 2007.

Notes: Sooty Shearwater (*Puffinus griseus*) is the most common Procellariiform seabird along the south-eastern South American coast. In recent years the wintering population off California has declined noticeably. This decline has been confirmed on the breeding grounds in New Zealand. In Chile, knowledge of the population is limited. Investigations on Isla Guafo were carried out during two seasons (03/04 and 04/05), beginning an ongoing monitoring and evaluation of the breeding population of this species in southern South America. On Isla Guafo we estimate a population of about 4 million birds that nest above 150 m above sea level (m.a.s.l.) under a forest without understory. Sooty Shearwaters on Isla Guafo prefer north and western slopes that we hypothesize protect them from the predominantly southerly winds. Population of the species from New Zealand and Australia are compared with the Isla Guafo population and the state of its conservation is discussed.

Beissinger, S.R. and Peery, M.Z. **Reconstructing the historic demography of an endangered seabird.** *Ecology* 88(2): 296-305, 2007.

Notes: Reducing extinction risk for threatened species requires determining which demographic parameters are depressed and causing population declines. Museum collections may constitute a unique, underutilized resource for measuring demographic changes over long time periods using age-ratio analysis. We reconstruct the historic demography of a U.S. federally endangered

seabird, the Marbled Murrelet (*Brachyramphus marmoratus*), from specimens collected; similar to 100 years ago for comparison with predictions from comparative analyses and with results from contemporary field studies using both age-ratio analysis and conventional demographic estimators. Reproduction in the late 1800s and early 1900s matched predictions from comparative analysis, but was 8-9 times greater than contemporary estimates, whereas adult survival was unchanged. Historic reproductive rates would support stable populations, but contemporary levels should result in population declines. Contemporary demographic estimates derived from age-ratio analysis were similar to estimates from conventional estimators. Using museum specimens to reconstruct historic demography provides a unique approach to identify causes of decline and to set demographic benchmarks for recovery of endangered species that meet most assumptions of age-ratio analysis.

Chaulk, K.G., Robertson, G.J., and Montevecchi, W.A. **Landscape features and sea ice influence nesting common eider abundance and dispersion.** *Canadian Journal of Zoology* 85(3): 301-309, 2007.

Notes: Factors that influence individual and colony spacing are still not well understood in many organisms. Common eiders (*Somateria mollissima* (L. 1758)) nest on coastal islands and forage in intertidal and shallow subtidal waters. We considered several biotic and abiotic factors, their interactions, and how these might influence the distribution of eider colonies at several spatial scales in Labrador, Canada. At the island level, nest abundance was not related to intertidal prey density. At the 104 km² grid scale, eider nest abundance and the coefficient of dispersion (CD; the variance to mean ratio of colony size or grid cell, where CD indicates population dispersion) were negatively related to the number of islands. Spring ice cover was positively related to the number of islands but was negatively related to eider nest abundance and to CD. Ice cover - abundance and ice cover - CD were significant at two spatial scales (104 and 455 km², respectively), but other relationships were weaker at the larger spatial scale. We hypothesize that during the spring, archipelagos with many islands trap ice, providing terrestrial predators access to nesting islands by acting as bridges and that increased predation reduces habitat quality causing nesting eiders to disperse. Our findings suggest that eiders respond to landscape features, including ice cover, a feature that is being influenced by climate change.

Jodice, P.G.R., Murphy, T.M., Sanders, F.J., and Ferguson, L.M. **Longterm trends in nest counts of colonial seabirds in South Carolina, USA.** *Waterbirds* 30(1): 40-51, 2007.

Notes: We analyzed temporal and spatial trends in annual nest counts of Brown Pelicans (*Pelecanus occidentalis*), Royal Terns (*Sterna maxima*), and Sandwich Terns (*Sterna sandvicensis*) throughout South Carolina from 1969 through 2005. There was an increase in the number of active pelican nests from 1969 through the mid 1980s, although this was followed by a steady decline that continued through 2005. Numbers of Royal Tern nests have declined during the study period, especially since 1990. In contrast, annual counts of active Sandwich Tern nests remained relatively stable through the mid 1980s, then increased substantially and have since remained stable. During the early years of the study, a greater proportion of nests from each species occurred on colonies within the Cape Remain region, although this distribution appears to have shifted with a greater proportion of nests now occurring along the southern coast. At the statewide level and at each of the primary colonies, we observed a positive correlation in counts of Brown Pelican and Royal Tern nests. Mechanisms underlying the observed trends are unclear. We suggest that priorities for research include (1) determination of diet and foraging locales for all three species, (2) impacts of ectoparasites on condition and survival of pelican chicks, and (3) metapopulation structure of all three species. Management activities should focus primarily on protection of colony sites.

Moller, A.P., Flensted-Jensen, E., and Mardal, W. **Agriculture, fertilizers and life history of a coastal seabird.** *Journal of Animal Ecology* 76(3): 515-525, 2007.

Notes: 1. Leakage of fertilizers from farmland has affected levels of nitrogen and phosphorus in many coastal areas, reducing limitation of primary productivity with consequences for timing and magnitude of the annual peak in phytoplankton and zooplankton. Such changes in nutrient availability may have affected temporal patterns of abundance of marine invertebrates and vertebrates that are the main prey of seabirds. 2. We investigated the extent to which changes in the use of fertilizers by farmers affected timing of breeding, clutch size, recruitment and longevity of a coastal seabird, the Arctic tern *Sterna paradisaea* Pont., in Denmark. 3. Timing of breeding advanced with the increase in use of fertilizers, with an effect as a consequence of a phenotypic response of individuals exposed to different levels of fertilizers. 4. Annual mean clutch size increased with the

amount of fertilizer. While individual Arctic terns increased their clutch size with fertilizer level, there was no evidence of individual Arctic terns in different years changing their clutch size in response to changes in fertilizer use. 5. Annual recruitment rate, estimated as the proportion of young that were subsequently recovered as adults, was related to fertilizer use. 6. Mean longevity, estimated as the maximum age of adult individuals, decreased in response to fertilizer use. 7. These findings provide evidence of fertilizer use in agriculture having significant indirect effects on timing of reproduction, clutch size, recruitment and longevity of a seabird.

Gonzalez-Zevallos, D., Yario, P., and Caille, G. **Seabird mortality at trawler warp cables and a proposed mitigation measure: A case of study in Golfo San Jorge, Patagonia, Argentina.** *Biological Conservation* 136(1): 108-116, 2007.

Notes: We studied the interaction between seabirds and warp cables in the high-seas Argentine hake *Merluccius hubbsi* trawl fishery operating in Golfo San Jorge, Argentina, and tested the efficacy of a simple mitigation measure designed to reduce mortality at warp cables. Observations were made onboard hake trawlers during the height of the fishing season, between December 2004 and April 2005. Thirteen seabird species used food made available by fishing operations. The most frequent and abundant seabirds (% occurrence, mean maximum number per haul) were the Kelp gull *Larus dominicanus* (98.1%, 348.5) and the Black-browed albatross *Thalassarche melanophrys* (96.1%, 132.2). Contacts with warp cables were recorded for six species in 81.4% of hauls, with a mean number of contacts per haul of 14.4 ± 23.8 (range = 0-127). A total of 53 individuals were killed due to interactions with nets and cables, resulting in a total cable mortality rate of 0.14 birds/haul. Considering the fishery's fishing effort, the estimated total number of birds killed during the study was 2703 (CV = 0.8), of which 306 (CV = 0.9) were killed due to contacts with warp cables (255 Kelp gulls and 51 Black-browed albatross). The tested device consisted of a plastic cone attached to each warp cable. In hauls with mitigation device, the number of contacts was reduced by 89% and no seabirds were killed. Mean distances between seabirds and cables were significantly larger in hauls with than without mitigation device (2.6 vs 0.9 m). The proposed device could be easily applied in this and other trawl fisheries operating in Argentine waters. Increased effort should be placed in implementing mitigation measures and the monitoring of cable related mortality associated to high-seas trawlers operating in the Argentine Continental Shelf.

Pon, J.P.S., Gandini, P.A., and Favero, M. **Effect of longline configuration on seabird mortality in the Argentine semi-pelagic Kingclip *Genypterus blacodes* fishery.** *Fisheries Research* 85(1-2): 101-105, 2007.

Notes: Incidental mortality of seabirds caused by longline fisheries in the south-western Atlantic Ocean has been assessed only with reference to the number of birds caught, not taking into account how the configuration of the gear affects mortality. We provide the first direct estimates of the impact on seabirds of the semi-pelagic fishing gear used in the Argentine Kingclip *Genypterus blacodes* fishery. The gear included weights and buoys, sequentially spaced along the lines, which enabled fishing to occur at different depths. During a fishing trip onboard the F/V Argenova XII in the austral summer of 2005, 74 birds were captured, comprising 56 White-chinned petrels *Procellaria aequinoctialis* and 18 Black-browed albatrosses *Thalassarche melanophrys*. More than half of the hooked birds were caught in the first third of the lines being set, and almost all White-chinned petrels (96%) and Black-browed albatrosses (83%) were caught within 30 m (i.e. 24 hooks) of buoys. The floats used in semi-pelagic longlines are likely to decrease the sinking rates of baited hooks near them, buoying up the lines near the surface and increasing the likelihood of seabird interactions. Although we lack information on the distribution of captured fish along these longlines, the most feasible methods to reduce seabird bycatch in the Argentine semi-pelagic longline fishery would be (1) to deploy lines without hooks near line floats (the removal of 24 hooks either side of each float should substantially reduce seabird interactions with gear) or (2) to use long snoods between the mainline and the floats, allowing the baited hooks to quickly sink beyond the reach of seabirds.

Karpanty, S.M., Fraser, J.D., Berkson, J., Niles, L.J., Dey, A., and Smith, E.P. **Horseshoe crab eggs determine red knot distribution in Delaware Bay.** *Journal of Wildlife Management* 70(6): 1704-1710, 2006.

Notes: A decline in red knots (*Calidris canutus rufa*) has been attributed to horseshoe crab (*Limulus polyphemus*) egg shortages on the Delaware Bay, an important foraging area for migrating knots. We studied the movements and distribution of 65 radiotagged red knots on Delaware Bay from May to June 2004 and related movements to the distribution and abundance of horseshoe crab eggs and other prey and to other habitat characteristics. The number of horseshoe crab eggs was the most

important factor determining the use of Delaware Bay beaches by red knots (logistic regression cumulative Akaike's Information Criterion adjusted for small sample size [AIC_c] w = 0.99). The knots shifted from emergent marsh and peat-beaches to sandy Delaware Bay beach when crab eggs became abundant, which also suggested the importance of crab eggs. While red knots used sandy beach zones more than expected, given their availability, 44% of red knot low tide locations were in bay and coastal emergent marsh. The abundance of *Donax variabilis* (AIC_c w = 0.95) and *Mytilus edulis* (AIC_c w = 0.94) spat, both food for red knots, had a relationship with red knot use of sandy beaches. Levels of disturbance and the abundance of laughing gulls (*Larus atricilla*) also were important factors in red knot sandy beach use, although secondary to prey resources (AIC_c w < 0.4). These results are consistent with the hypothesis that the abundance of horseshoe crab eggs on sandy beaches is driving movement and distribution of red knots and that there is little alternative food during the migratory stopover in Delaware Bay. Our findings that red knots disproportionately use Delaware Bay sites with abundant eggs and that there is a lack of surplus eggs at areas used and unused by red knots support the continuation of management for sustained yield of horseshoe crabs and other food resources at this stopover.

Wilson, H.M., Flint, P.L., Moran, C.L., and Powell, A.N. **Survival of breeding Pacific common eiders on the Yukon-Kuskokwim Delta, Alaska.** *Journal of Wildlife Management* 71(2): 403-410, 2007.

Notes: Populations of Pacific common eiders (*Somateria mollissima v-nigrum*) breeding in Alaska, USA, have declined markedly over the past 40 years. We studied survival of adult female Pacific common eiders using capture-recapture of nesting hens at 3 sites on the Yukon-Kuskokwim Delta (YKD), Alaska from 1994 to 2004. We used data consisting of 268 recapture events from 361 uniquely marked individuals to investigate temporal, geographic, and environmental variation in adult female survival. Our results suggest apparent annual survival of adult eiders from the YKD was high (0.892, SE = 0.022) and spatially and temporally invariant ($\sigma^2 = 0.005$), a pattern consistent with other long-lived marine birds. Moreover, our results suggest adult survival may be functionally fixed for Pacific common eiders, and at the present, adult survival may be relatively unresponsive to environmental or management perturbations. Our data did not support hypothesized variation in survival relative to mortality factors such as predation on breeding grounds, physiologic costs of reproduction, and wintering conditions. Although changes in adult survival likely have a large potential effect on prospective population growth, our results suggest viable management actions aimed at increasing survival may be extremely limited.

Barham, P.J., Underhill, L.G., Crawford, R.J.M., and Leshoro, T.M. **Differences in breeding success between African Penguins (*Spheniscus demersus*) that were and were not oiled in the MV Treasure oil-spill in 2000.** *Emu* 107(1): 7-13, 2007.

Notes: About 19000 African Penguins (*Spheniscus demersus*) were oiled when the bulk ore carrier MV Treasure sank off the west coast of South Africa in June 2000. Of these, more than 17000 Penguins were cleaned, rehabilitated and released back to the wild. The breeding success of these birds was compared with unoiled birds and birds oiled during other oil-spills, by measuring fecundity, hatching success and fledging success from 2001 to 2005 on Robben Island. Fledging success averaged 61% in birds that were not oiled in the Treasure spill and 43% in birds oiled during the Treasure event, with a large proportion of the reduction attributable to higher mortality of older chicks. Factors that may have contributed to differential fledging success include long mean intervals between capture and cleaning (22 days) and between capture and release (48 days) for birds oiled in the Treasure spill. One implication of these results is, if a similar large spill should occur in the future, every effort should be made to treat the oiled birds as quickly as possible to reduce the risk of their suffering a similar reduction in breeding productivity. Further, the other interventions, such as relocation of unoiled birds and captive-rearing of orphaned chicks may need to receive higher priority than hitherto.

Rayner, M.J., Hauber, M.E., and Clout, M.N. **Breeding habitat of the Cook's Petrel (*Pterodroma cookii*) on Little Barrier Island (Hauturu): Implications for the conservation of a New Zealand endemic.** *Emu* 107(1): 59-68, 2007.

Notes: Cook's Petrel (*Pterodroma cookii*), a trans-equatorial migrant endemic to the New Zealand archipelago, is today endangered and restricted to island habitats at the northern and southern extents of its former range. To improve the limited knowledge of the breeding habitat of this species, we combined an island-wide survey, the mapping capabilities of geographic information systems, and logistic and autologistic analyses to examine burrow distribution and habitat use of the world's

largest population of Cook's Petrel, on Little Barrier Island (Hauturu). Our results show that, on this island, Cook's Petrel breeds predominantly above 300 m above sea level, on steeper slopes, closer to ridge tops, and in unmodified forest habitats with low and open canopies and greater numbers of large stems compared to the available terrain and habitat. Within these habitats above 300 m, densities of burrows are 0.04 burrows m⁻². Through comparisons with habitat data from two low-altitude colonies, we conclude that the current distribution of this population is a result of habitat selection and historical human-mediated impacts. We suggest that mature forest habitats, close proximity to ridge tops, and steep slopes are key habitat requirements for this species. A large amount of suitable habitat is available for Cook's Petrel on Little Barrier Island and the recent removal of introduced predators is expected to result in an expansion of this population. The results of the current study provide useful information to aid in the restoration of former colony sites on other islands and the New Zealand mainland.

Becker, B.H., Peery, M.Z., and Beissinger, S.R. **Ocean climate and prey availability affect the trophic level and reproductive success of the marbled murrelet, an endangered seabird.** *Marine Ecology Progress Series* 329: 267-279, 2006.

Notes: We investigated relationships between oceanographic processes, prey availability, diet and the reproductive success of the marbled murrelet *Brachyramphus marmoratus* (Alcidae), a federally threatened seabird. We predicted that cooler ocean conditions (which increase primary productivity in this eastern boundary upwelling system) should result in heightened prey availability and hence higher reproductive success for the murrelet. We also expected that murrelet diets should reflect those potential prey species that are most abundant during any given season or year. Oceanographic conditions were considered at 2 spatial scales: synoptic (Northern Oscillation Index, NOI; Pacific Decadal Oscillation Index, PDO; the North Pacific Index, NPI), and local (upwelling index, UI; sea surface temperature, SST; strength of the spring turnover). To infer seasonal and annual variation in murrelet diets in central California, we used stable isotope analyses of $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ in murrelet feathers and prey tissues during the pre- and postbreeding seasons of 1998 to 2002. Isotopic signatures of 10 species of potential prey clustered into 3 distinct groups (low, mid and high trophic level seabird prey). During 1999 to 2001, when more krill (low trophic level prey) were available, murrelet $\delta^{15}\text{N}$ and trophic level were lower prior to breeding than after breeding, whereas pre- and postbreeding diets were similar during 1998 and 2002 when fewer krill were available. VC was always lower in prebreeding than postbreeding diets, which tracked availability of ^{13}C enriched juvenile rockfish and market squid. Diet did not differ by sex for either isotope. Murrelet productivity (juvenile:adult ratios) was positively correlated with both rockfish and krill abundance. PDO, NOI, UI, spring turnover strength and NPI indices were unrelated to murrelet productivity and to prey abundances. Murrelet productivity was also positively related to the proportion of mid trophic level prey in postbreeding diets, and thus negatively related to the proportion of low and high trophic level prey consumed. Furthermore, productivity was markedly higher following the apparent 1998 to 1999 PDO regime shift to cooler conditions. These data suggest that cooler local temperatures support increased availability of krill and juvenile rockfish to murrelets, and that this improves murrelet reproductive success.

Erwin, C.A. and Congdon, B.C. **Day-to-day variation in sea-surface temperature reduces sooty tern *Sterna fuscata* foraging success on the Great Barrier Reef, Australia.** *Marine Ecology Progress Series* 331: 255-266, 2007.

Notes: Many seabird species threatened by global climate change are found mainly or exclusively in tropical regions. A shortage of long-term data linking climatic variation, oceanography and tropical seabird reproductive biology at both within- and between-season temporal scales means that the potential impact of climate change on these species is largely unknown. The sooty tern *Sterna fuscata*, an almost ubiquitous tropical seabird, has been declining on the Great Barrier Reef (GBR), Australia, over the last 3 decades. We examined the relationship between sooty tern foraging success and sea-surface temperature (SST) at Michaelmas Cay over 2 consecutive breeding seasons. Consistent patterns were observed with significant negative relationships between day-to-day variation in SST and both the amount of food fed to chicks and the feeding frequency during the latter two-thirds of each breeding season. At the beginning of each breeding cycle, rapid changes in foraging success highlighted that other within-season mechanisms also influence sooty tern reproductive potential. Our results suggest a previously undescribed spatial and temporal link between SST and sooty tern reproduction. Combined with previous findings for the southern GBR, this suggests that SST variation can influence the foraging success of multiple tropical seabird species at a reef-wide scale and implies a significant negative effect of forecasted climatic changes on seabirds breeding on the GBR.

Hahn, S., Reinhardt, K., Ritz, M.S., Janickel, T., Montalti, D., and Peter, H.U. **Oceanographic and climatic factors differentially affect reproduction performance of Antarctic skuas.** *Marine Ecology Progress Series* 334: 287-297, 2007.

Notes: We studied how environmental conditions affect reproduction in sympatric skua species that differ in their reliance on marine resources: the exclusively marine foraging south polar skua *Catharacta maccormicki*, the terrestrially foraging brown skua *C. antarctica lonnbergi* and mixed species pairs with an intermediate diet. Egg size, clutch asymmetry and hatching dates varied between species and years without consistent patterns. In the south polar skuas, 12 to 38% of the variation in these parameters was explained by sea surface temperature, sea ice cover and local weather. In mixed species pairs and brown skuas, the influence of environmental factors on variation in clutch asymmetry and hatching date decreased to 10-29%, and no effect on egg size was found. Annual variation in offspring growth performance also differed between species with variable growth in chicks of south polar skuas and mixed species pairs, and almost uniform growth in brown skuas. Additionally, the dependency on oceanographic and climatic factors, especially local wind conditions, decreased from south polar skuas to brown skua chicks. Consistent in all species, offspring were more sensitive to environmental conditions during early stages; during the late chick stage (>33 d) chick growth was almost independent of environmental conditions. The net breeding success could not be predicted by any environmental factor in any skua species, suggesting it may not be a sensitive indicator of environmental conditions. Hence, the sensitivity of skuas to environmental conditions varied between species, with south polar skuas being more sensitive than brown skuas, and between breeding periods, with the egg parameters being more susceptible to oceanographic conditions. However, during offspring development, local climatic conditions became more important. We conclude that future climate change in the Maritime Antarctic will affect reproduction of skuas more strongly through changes in sea ice cover and sea surface temperature (and the resulting alterations to the marine food web) than through local weather conditions.

Petry, M.V., Fonseca, V.S.D., and Scherer, A.L. **Analysis of stomach contents from the black-browed albatross, *Thalassarche melanophris*, on the Coast of Rio Grande do Sul, Southern Brazil.** *Polar Biology* 30(3): 321-325, 2007.

Notes: The black-browed albatross, *Thalassarche melanophris*, travels along the southern coast of Brazil during migration. Their numbers appear to have decreased in recent years. From July 1997 to 1998, we carried out monthly surveys on the coast of Rio Grande do Sul, Southern Brazil, to count albatrosses in the area and identify ingested items. We found 85 dead specimens of *T. melanophris*, from which 35 stomachs were collected and the contents analyzed. Nearly 6% of the stomachs contained fish, 32% contained cephalopods and 9% contained crustaceans. About 69% of the stomachs contained nematodes and nematomorphs. The highest abundance values found per stomach was 182 nematode individuals and 223 nematomorph individuals. Synthetic materials were present in 29% of the stomachs analyzed, comprising thermoplastic, nylon, rubber and metal wire.

Otley, H., Reid, T., Phillips, R., Wood, A., Phalan, B., and Forster, I. **Origin, age, sex and breeding status of wandering albatrosses (*Diomedea exulans*), northern (*Macronectes halli*) and southern giant petrels (*Macronectes giganteus*) attending demersal longliners in Falkland Islands and Scotia Ridge waters, 2001-2005.** *Polar Biology* 30(3): 359-368, 2007.

Notes: A total of 547 sightings of 291 banded wandering albatrosses *Diomedea exulans* and 21 sightings of 14 banded giant petrels *Macronectes* spp. were made from toothfish longliners operating on the southern Patagonian Shelf during 2001-2005. This included 25% of the wandering albatrosses with Darvic bands that bred at Bird Island (South Georgia) during this period. Thirteen of the northern *Macronectes halli* and southern giant petrels *Macronectes giganteus* had been banded at South Georgia, and there was one sighting of a southern giant petrel from Argentina. Male and female wandering albatrosses of all age classes except young birds (< 15 years old) were equally likely to attend longline vessels. Most sightings of all age classes were made during the incubation period and fewest during the brood period. Eighty-six percent of birds sighted had bred at least once before, with half currently breeding and half on sabbatical (i.e. between breeding attempts). Almost half of the wandering albatrosses were sighted on more than one occasion. The data confirms that the southern Patagonian shelf is an important foraging area for wandering albatrosses and northern and southern giant petrels, and that some individuals show consistent associations in multiple years with longline vessels fishing in the region.

Catry, P., Silva, M.C., MacKay, S., Campos, A., Masello, J., Quillfeldt, P., and Strange, I.J. **Can thin-billed prions *Pachyptila belcheri* breed successfully on an island with introduced rats, mice and cats? The case of New Island, Falkland Islands.** *Polar Biology* 30(3): 391-394, 2007.

Notes: Small burrowing petrels nesting on islands rarely survive introductions of mammalian predators. On New Island, a population of around two million pairs of thin-billed prions nests despite the presence of introduced ship rats, house mice and feral cats. Understanding the mechanisms of such coexistence is important, as it is important to establish a baseline for future monitoring. To do this, prion breeding success was determined for 7 years and in several habitats. Breeding success was high, except for the small fraction of the population that nests in tussock *Poa flabellata* stands, where several lines of evidence suggest significant predation by rats. Such high breeding success possibly resulted from predator swamping in this highly seasonal environment. This study suggests that introduced mammals do not currently depress thin-billed prion breeding success on New Island. However, cats and rodents might have future harmful effects if external factors depressed the prion population or allow a significant population growth of predators on New Island.

Sander, M., Balbao, T.C., Costa, E.S., dos Santos, C.R., and Petry, M.V. **Decline of the breeding population of *Pygoscelis antarctica* and *Pygoscelis adeliae* on Penguin Island, South Shetland, Antarctica.** *Polar Biology* 30(5): 651-654, 2007.

Notes: This work is a quantitative analysis of the population of breeding pairs of *Pygoscelis adeliae* and *Pygoscelis antarctica*, which use Penguin Island as a breeding area. There was a decrease in the populations of *P. adeliae* and *P. antarctica* by 75 and 66%, respectively, from the breeding season of 1979/1980 to 2003/2004. A mixed breeding colony of both species was also documented, according to published data which has existed since 1979/1980. The *P. antarctica* has an advantage over *P. adeliae* in this mixed breeding situation, where the breeding pairs of the former increased by 127%, indicating an interspecies competition for nesting ground.

Sander, M., Balbao, T.C., Polito, M.J., Costa, E.S., and Carneiro, A.P.B. **Recent decrease in chinstrap penguin (*Pygoscelis antarctica*) populations at two of Admiralty Bay's islets on King George Island, South Shetland Islands, Antarctica.** *Polar Biology* 30(5): 659-661, 2007.

Notes: We examined the breeding populations of chinstrap penguins (*Pygoscelis antarctica*) on Chabrier Rock and Shag Island within Admiralty Bay, King George Island, South Shetland Islands, Antarctica from 2002 to 2004. When comparing our results to historic data from 1979, we found an overall decline of 57% in the last 25 years, mirroring the population trend of this species in other regions of the Antarctic Peninsula. Our results are discussed in relation to factors hypothesized to be driving the declines found at other sites, as well as the importance of consistent annual censuses to accurately determine population trends.